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AND THE SCIENCES SUPPORTING PUBLIC HEALTH

Historic Carpenters' Hall, where the Philadelphia College of Pharmacy and Science was founded 125 years ago.

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CONTENTS

E D I T O R I A L

PHARMACY IN 1946

CONDITIONS and circumstances surrounding and affecting pharmacy will change radically in this new year 1946. Yet it is with a distinct feeling of optimism that we face the new year with the prospects for peace and prosperity the brightest in several decades.

Our conversion from war to peace has taken place even more rapidly than we had thought possible and it is a tribute to American industry and the adaptability of Americans to new conditions that this has been done. The rapid relaxation of war-time controls by Washington has also been a favorable influence, although there is still in some high places the erroneous belief that war-time restrictions and compulsions are a part of regular government function in time of peace. This sentiment must be contested by all freedom-loving Americans as smacking of totalitarianism and contrary to our way of life.

Pharmacy, specifically, seems to be headed for a most prosperous year with consumer demand maintained at war-time levels plus a very much improved supply of drugs and related merchandise. Fortunately, labor disputes have not involved the drug industry to any appreciable degree since it has never proven a fertile field for labor organizations of the more radical type. The manpower situation will ease but slightly, if at all, inasmuch as the release of pharmacists from the armed services is more than offset by increased opportunities in fields related to pharmacy which now strongly compete for the services of a broadly trained man exemplified by the product of modern pharmaceutical education. Colleges of pharmacy will see an enrollment which will make them take steps to limit their freshmen classes to some set figure. In this respect colleges should resist the temptation to make up for the lean war years and not take more students than can be properly taught and assimilated into the ranks of pharmacy. Although the demands for pharmacists today are loud and insistent, colleges should not set their production quotas so high that retrenchment will become necessary in a few years. Limitation

of enrollment under the direction of the American Association of Colleges of Pharmacy may soon become a "burning question."

Pharmacy in all of its branches should give particular attention to the returning veteran to see that he becomes integrated in the profession where he can function best and derive the greatest satisfaction from his work. We must remember that the placement of a veteran in a position for which he is unsuited by temperament or training renders him a disservice even though it is done with the best intentions and the desire to reward him for his many sacrifices. Veterans do not ask for special favors; they only want a fair opportunity at that level at which they are qualified to serve.

The year 1946 will see a return of those conventions and meetings which have been missed by those who always gained pleasure and inspiration in the opportunity of meeting their colleagues and fellow workers for an exchange of ideas as well as the social activities afforded. We shall this year at the A. Ph. A. Convention have reason to be proud of the progress made by organized pharmacy under the leadership of our new Secretary. State conventions at mountain and seashore resorts will again offer that intriguing blend of business and pleasure that only a state convention knows.

All in all it promises to be a great year; a year of hard work but one accompanied by success and the satisfaction of knowing that the dark days of war are over and that pleasure travel, relaxation, rest and the enjoyment of good things need no longer be considered as vices and immoral but the honest reward for hard work and service rendered.

L. F. Tice

RESISTANCE OF STAPHYLOCOCCUS AUREUS CULTURED IN SEMI-SYNTHETIC AND F. D. A. MEDIA *

By George F. Reddish, Lois B. Wood and Vera L. Burlingame **

WHEN the present standard methods of testing antiseptics were developed, the culture medium for growing the test organism received particular attention. As a result of careful study by those participating in the development of these methods, it was found that the kind of peptone used greatly affected the resistance of the test organism, *Staphylococcus aureus.* Of the various brands tested, it was found that Armour's Peptone was best suited for this purpose (1, 2).

A medium of the following composition was found most satisfactory:

1.0% Armour's Peptone
0.5% Liebig's Beef Extract
0.5% NaCl
Adjusted to pH 6.8

The normal resistance of *S. aureus* (3) was easily maintained in this medium. Satisfactory results were obtained until about 1932.

At about this time Armour & Co. were asked to supply a specially purified peptone for use in media employed in testing antiseptics and disinfectants. It was soon found that *S. aureus* grown in media made with this specially purified peptone gave variable results and generally became weaker. As a result bacteriologists had considerable difficulty in obtaining consistent results and in maintaining the resistance of the test organisms according to official standards.

Because of this unsatisfactory situation a special committee was appointed by the National Association of Insecticide and Disinfectant Manufacturers to study this problem. It was soon found that this difficulty was due to the peptone and that some of the essential in-

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** Lambert Pharmacal Company, St. Louis, Mo.

gredients were removed in the process of purification. This committee was able to convince Armour & Co. and others that the peptone should not be purified but should be made in the usual manner. This has been done with the result that the resistance of *S. aureus* can be maintained in media made with Armour's peptone as now made and as approved by this committee of the N. A. I. D. M.

It seems, however, that some bacteriologists continued to experience some difficulty in maintaining the resistance of this organism to meet Food and Drug Administration standards. Although the authors have not experienced this difficulty, they are fully informed as to the experience of others. The desirability of developing a suitable substitute medium for this purpose has been discussed for the past few years.

Two such media have recently been suggested. Klarmann and Wright (4) made a careful study of the possibilities of synthetic and semi-synthetic media for this purpose and have recommended a semi-synthetic medium which they found quite satisfactory. Wolf (5) has suggested another semi-synthetic medium which he claims will maintain resistance of *Eberthella typhosa* and *S. aureus* equal to or better than that obtained with regular F. D. A. peptone media.

Although, as just stated, we have not experienced difficulty with the standard F. D. A. peptone media, we became interested in comparing these three media. Since we are most interested in the testing of antiseptics, we have limited our comparative test to *S. aureus*. For this purpose we have used phenol because it is recognized as the standard for this purpose, and in addition, have conducted similar tests on Liquor Antisepticus N. F. VII.

The media employed were made as follows:

(a) F. D. A. Broth of the above composition.

(b) Klarmann and Wright's semi-synthetic medium:

Water, distilled	1000 cc.
Casamino Acids (Difco)	10 gm.
Liver Vitamin B Concentrate U. S. P. XII (Wilson Labs.)	3 gm.
Sodium Chloride	5 gm.
Magnesium Sulfate	0.1 gm.

pH — 7.2

(c) Wolf's semi-synthetic medium:

$K_2HPO_4 \cdot 3H_2O$	3.0 gm.
Purified Casamino Acids (Difco)	5.0 gm.
NaCl	2.5 gm.
Uracil	5.0 mg.
Thiamine hydrochloride	1.0 mg.
Niacin	1.0 mg.
Inorganic salt solution	2.5 ml.
H_2O	1 liter

pH — 7.2-7.4

Each of these media (10 cc.) was inoculated with *S. aureus* of normal resistance, incubated at 37° C. for twenty-four hours, and transfers were made into each of the media every day for four weeks. At the end of each week the cultures were tested for resistance against phenol and Liquor Antisepticus N. F. at 37° C. (See Tables 1 and 2.) Nutrient agar plate counts were also made of each culture at the same time, that is, at weekly intervals. (See Table 3.)

The results obtained appear in Tables 1 and 2 below.

The resistance of the test organism to phenol was about the same when grown in each of the three media for the first two weeks. At the end of the third and fourth weeks, however, the culture grown in F. D. A. broth was more resistant to phenol than the culture grown in the two semi-synthetic media. These differences were not great but were sufficient to show that F. D. A. broth was better than the other two media for maintaining the resistance of *S. aureus* to phenol.

When tested against Liquor Antisepticus the culture in F. D. A. broth was shown to be much more resistant than the cultures grown in the two semi-synthetic media. The resistance of the cultures grown in the two semi-synthetic media became much weaker after the first week of incubation. It is significant that the culture grown in F. D. A. broth was of constant resistance during the entire four weeks' period of the test.

TABLE I

PHENOL

Dilution	1 week 1 min.	1 week 5 min.	1 week 10 min.	2 weeks 1 min.	2 weeks 5 min.	2 weeks 10 min.	3 weeks 1 min.	3 weeks 5 min.	3 weeks 10 min.	4 weeks 1 min.	4 weeks 5 min.	4 weeks 10 min.
F. D. A. Broth *S. aureus* 37° C.												
1-70	o	o	o	o	o	o	+	o	o	+	o	o
1-80	+	+	+	+	+	o	+	+	o	+	+	o
1-90	+	+	+	+	+	+	+	+	+	+	+	+
1-100	+	+	+	+	+	+	+	+	+	+	+	+
Klarmann-Wright Medium *S. aureus* 37° C.												
1-70	o	o	o	o	o	o	o	o	o	o	o	o
1-80	+	+	+	+	+	o	+	o	o	+	o	o
1-90	+	+	+	+	+	+	+	+	+	+	+	o
1-100	+	+	+	+	+	+	+	+	+	+	+	o
Wolf Medium *S. aureus* 37° C.												
1-70	+	o	o	o	o	o	o	o	o	o	o	o
1-80	+	+	o	+	o	o	+	o	o	+	o	o
1-90	+	+	+	+	+	o	+	+	+	+	o	o
1-100	+	+	+	+	+	+	+	+	+	+	+	o

TABLE 2

LIQUOR ANTISEPTICUS N. F. VII

	Time Intervals of Test											
	1 week			2 weeks			3 weeks			4 weeks		
Dilution	1 min.	5 min.	10 min.	1 min.	5 min.	10 min.	1 min.	5 min.	10 min.	1 min.	5 min.	10 min.
F. D. A. Broth *S. aureus* 37° C.												
1 + 3	o	o	o	o	o	o	o	o	o	o	o	o
1 + 4	+	o	o	+	o	o	+	+	o	+	o	o
1 + 5	+	+	o	+	+	o	+	+	o	+	+	o
1 + 6	+	+	+	+	+	+	+	+	+	+	+	+
Klarmann-Wright Medium *S. aureus* 37° C.												
1 + 3	o	o	o	o	o	o	o	o	o	o	o	o
1 + 4	o	o	o	o	o	o	o	o	o	o	o	o
1 + 5	+	o	o	+	o	o	o	o	o	o	o	o
1 + 6	+	+	+	+	+	+	+	o	o	+	+	o
Wolf Medium *S. aureus* 37° C.												
1 + 3	o	o	o	o	o	o	o	o	o	o	o	o
1 + 4	+	o	o	o	o	o	o	o	o	o	o	o
1 + 5	+	+	o	o	o	o	o	o	o	o	o	o
1 + 6	+	+	+	+	+	o	o	o	o	o	o	o

This difference is also reflected in the bacterial counts obtained in the three media at these time periods of test. The following plate counts were obtained at the above time periods.

TABLE 3

BACTERIAL PLATE COUNTS ON NUTRIENT AGAR

(Number per cc. in 24 hour cultures)

	Time Interval			
	1 week	2 weeks	3 weeks	4 weeks
F. D. A. broth	600,000,000	590,000,000	490,000,000	460,000,000
Klarmann-Wright medium	——	520,000,000	490,000,000	470,000,000
Wolf medium	——	220,000,000	232,000,000	230,000,000

These results are significant since it is well known that the resistance of this test organism depends to a large extent on the numbers used in the test.

It is also of interest to note that at the end of the third and fourth weeks there were only a few white colonies in the plates made from cultures grown in F. D. A. broth and the Klarmann-Wright semi-synthetic medium, whereas nearly all the colonies were white in the plates made from cultures grown in the Wolf medium for three and four weeks. This also is significant since the appearance of large numbers of white colonies indicates a weakening of cultures of *S. aureus.* When this organism is grown under favorable conditions, however, there are very few if any white colonies when grown on nutrient agar plates.

Conclusion

F. D. A. broth is very satisfactory for maintaining the resistance of *Staphylococcus aureus* to phenol and to Liquor Antisepticus N. F. Cultures of this test organism are weakened when grown in the semi-synthetic media of Klarmann and Wright and of Wolf; these media are not as satisfactory as F. D. A. broth for maintaining the resistance of this test organism. It is evident from these results that F. D. A. broth is still a satisfactory medium for maintaining the normal resistance of *Staphylococcus aureus.*

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INSECT AND RODENT CONTROL *

By John M. Snyder **

Introduction

OF all the damnable charges which may be brought against a firm by the Food and Drug Administration, the one which results in the most unfavorable publicity is "contaminated with filth." A very large percentage of seizures of foods and drugs are for reasons of filth or filthy manufacturing conditions. During the last fiscal year there were 2,395 seizures of foods; 1,762 or 74 per cent were for this charge. Drug firms have a lower percentage of seizures than this but it is impressive nevertheless.

Moreover the Food and Drug Administration has the authority to go directly to the plant or warehouse of a company to obtain evidence. The Administration inspectors are especially trained to look for evidence of rats and insects. Usually this evidence is only too apparent. Trails, holes in walls and doors, droppings and urine, are normally apparent when rats or mice are present. For instance even dried urine is easily visible under ultraviolet light. Evidence of insects is usually easy to see in the product or the building.

On finding evidence of contamination, samples are taken which are analyzed by the Administration's sedimentation and flotation method which concentrates the contaminants. These, which include rat hairs or droppings, insect legs, bodies and wings, and other filth, are then collected in a sample bottle to be used as evidence.

Seizures of the product are then made by a United States Marshal under the Department of Justice. A second offense may be followed by an injunction and criminal action, measures which are used in cases where the public interest is impaired in the Food and Drug Administration's opinion because unsanitary conditions have remained uncorrected.

Since there are a large number of diseases which can be transmitted through contaminated foods and drugs, it would seem that

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* Presented before the Proprietary Association of America, New York, December 5, 1945.

** Shoreham Building, Washington, D. C.

the Food, Drug and Cosmetic Act is not unreasonable. For this reason and for reasons of financial loss from civil suits and ruined materials, as well as for reasons of pride in one's company, every company manufacturing products for human consumption should install methods of controlling rodents and insects. The following paragraphs are an attempt to outline some of the procedures which can be used in controlling these pests. Under most conditions it will not be necessary to use all of the methods to obtain adequate control.

Description of Rodents and Insects

Before commenting on the methods of controlling rodents and insects, it is necessary to give a brief description of the pests themselves and their living and breeding habits.

Of the numerous animals which fall into the order of rodents, only the house rat and the common mouse will be considered. Of the two, rats are by far the more destructive and difficult to control. Of the three kinds of rats found in the United States, two—the black or ship rat (*Rattus rattus rattus*) and the roof or Alexandrian rat (*Rattus rattus alexandrius*)—are identical in their habits and can be considered together. Moreover, these two are confined to seaports and sections of the Gulf States and are outnumbered five to one whenever they are found together by the third kind, the brown rat (*Rattus norwegicus*). The most important member of the species is, then, the brown rat, sometimes also known as the sewer, wharf, barn, grey or Norway rat. Because of the resulting confusion from these different names and because of the variation in size and in color (varying from brown to grey to black), the brown rat is often thought to be more than one distinct species.

In daylight, house rats have poor vision and move around in a groping manner except when running beside a wall or other object which allows them to make use of their long whiskers. For this reason and for security, rats are nocturnal in their habits and usually retire to their burrows in the daytime. They seem always to travel the same path when going between their nests, their source of food and the outside, a habit which is useful in their control since the pathways become darkened from grease, dirt and filth carried by their feet and fur. Moreover, they seem to prefer to travel the hard way, making use of out of the way places, overhead pipes, beams and ledges. Rats are good climbers, the black and roof rats being better

in this respect than brown rats. The former can easily negotiate telephone or electric lines to enter a building near the roof and can scale brick walls and climb trees. Brown rats, although not as good as the others, can climb small pipes and drains. Low nesting places are selected by brown rats, high ones by the other two, but comfortable harborages near sources of food and water are preferred. Wood affords little protection because of their exceptional gnawing ability. Under experimental conditions where the rats were starving and gnawing edges were present, several inches of coarse concrete, bricks and even medium aluminum were gnawed through. Rats are practically omniverous and will eat nearly all the foods of man or domestic animals plus others, such as soap, which are unpalatable to man.

Rats, whose life expectancy is three years, have from three to twelve litters per year and average ten young per litter. This, coupled with the fact that they are great travelers and migrate great distances, explains why any rat control measures should be continuous, especially in establishments where food is obtainable.

Mice, being smaller than rats, do not cause as much damage nor do they transmit as many diseases. Nevertheless they are potentially dangerous and can transmit a number of diseases through food or drug products and it is important to control them. Fortunately most measures for controlling rats will also control mice. There is only one species of house mouse in the United States, the common house mouse (*Mus musculus*). The habits of mice and rats are similar except that the former do not travel as extensively, seldom leaving the building in which they live. Nor are mice as good gnawers.

It is impossible to cover all of the many insects which could contaminate foods or drugs. The drug field is especially difficult to cover since many drugs are imported from tropical countries where the native insects may be entirely different from those in the United States. Control of insects in this paper will be confined to the various household insects such as flies, gnats, cockroaches, fleas, moths and ticks as well as some of the weevils, beetles and moths which infest cereals. Many of the methods of controlling these will be effective in controlling most of the others which will be encountered, but it would be making too broad a statement to say that any one method would control all insects.

Control by Building Construction

Of the many methods of controlling rodents, building construction offers the only chance of permanent success. Modern construction opposes almost everything which is to the best interests of the rats. The modern materials of construction—good concrete, brick and steel—are impervious to rats and are used in a manner which eliminates all dead spaces between walls and floors, except those completely sealed off. Dark corners and other hiding places are also eliminated, leaving the rodent no place to live as well as no means to enter.

The principles involved in the construction of a rat-proof building are threefold. The building should be constructed to prevent rodents from:

1. Entering the buildings.
2. Gaining access to food in the buildings.
3. Finding safe harborage within the building.

If either of the first two principles could be completely achieved there would be no rats in the building and if the last were achieved it is doubtful that rats would be very troublesome provided there were no safe harborages near the building.

Unfortunately the complete achievement of any of the above is well nigh impossible. However, they may be approached close enough to discourage rats and mice from remaining in a building once they have gotten in. This, coupled with poisoning or one of the other methods of controlling the pests, should be adequate to control completely any rats or mice.

Every new building should be rat-proofed. Furthermore most cities have passed laws requiring them to be so. Each building offers a different problem but it is possible to offer a few recommendations to aid in the following of the principles already outlined.

The foundation should be constructed of material impervious to gnawing such as concrete and should present an unbroken surface around the building.

The foundation walls of the building should extend at least twenty-four inches below and twelve inches above ground level and should be of concrete or similar material. Any pipes or electric wire conduits penetrating the walls or foundation should be made integral with the wall by means of concrete or steel sheet. Areas around

doors and windows should be sealed and the doors and windows themselves should either be screened, which also keeps out insects, or if wooden, flashed with galvanized steel to a height of ten inches from the sill or other platform which a rat could stand on to gnaw. Care should be taken to make the walls integral with the roof especially in areas where the black and roof rats are found because of their climbing ability.

Buildings should have basements constructed with concrete or other material impervious to rats, or should have ground floors of the same construction if there is no basement. Floor drains or other openings should be covered with gratings whose maximum openings should not be greater than one-half inch in width or diameter. If it is necessary that the ground floor be of wood, the floor should be elevated at least two feet and the area underneath should be kept open and well ventilated.

Any ventilators, louvers or skylights which penetrate the roof should be adequately screened to prevent ingress of rats or insects.

All double walls in the building should be fire-stopped with concrete, sheet metal or brick. This should be done both at the top and bottom of the wall and also at intermediate floor levels if the construction is such that openings exist between the spaces under the floors and the double walls. All dead spaces in ceilings, hollow columns, under stairways, or elsewhere in the building should be sealed or done away with.

Whenever it is practicable, anything that rodents will eat (and this includes oils, fats, greases, soap and leather products as well as almost everything that man will eat) should be stored in covered metal or metal lined bins or containers.

Buildings should also be constructed in such a way as to eliminate as many cracks, corners and crevices as possible. Many new buildings are being built with curved fillets between all walls and floors. Places which are easy to clean are more often kept that way. The United States Navy often paints a ten-inch white strip on the floor along all walls. Thus any dirt in corners becomes clearly visible and is usually cleaned up. Insects as well as rodents must have food to eat and places to breed. If these are not available the insects will not stay.

Out of the way places such as under platforms or steps which a building contractor is liable to skimp on are just the spots that rats

will seek to gain entry. It is important to inspect the building while it is being constructed to assure that the building is actually rat-proof.

Old buildings offer a decidedly more difficult problem than new ones. The same principles hold, but it is usually more difficult to achieve them. About the best procedure in rat-proofing old buildings is to inspect them for rat entrances, trails, harbors and feeding places. Finding these is usually not difficult because of the dirt and grease which rats leave in their paths and their habit of always using the same paths. Then the entrances to harbors, feeding places and the outside should be sealed with rat-proof material, together with all other likely entering places. It is probably wise to use one or more of the methods of destroying the rodents, such as fumigation, poisoning, or trapping at the same time the building is rat-proofed.

If foundation walls do not extend at least two feet below the ground they should be made to do so either by filling a trench with concrete or by sinking galvanized sheet to the proper depth. In either case care must be taken to make the new addition integral with the old wall and to make sure that the new wall is continuous around the building.

Wooden doors and windows should be screened and metal flashed for protection against both rodents and insects. All other openings should be screened or closed. It may be necessary to flash the juncture of wooden floors and walls.

A great number of tests have been made on materials of construction to determine the ability to resist rats. Three which are considered to be rat-proof and which will cover most applications are:

1. 1:2:3 mix concrete, four inches thick and finished to a smooth surface.
2. 18-gauge sheet steel.
3. 14-gauge woven wire or metalace with not greater than one-half-inch openings.

Of course the workmanship must be good to insure that the installations will be actually rat-proof. Any repair work which is to be done after the completion of the rat-proofing should be done in the same manner. The building should be inspected from time to time to make sure that the installations remain intact.

Rodenticides

Although building construction is the only method of permanently controlling rodents, oftentimes it is impractical to use this method. At other times it is necessary to combine construction of the building with the destruction of the animals and in some places continual killing of the rats is the only practical method of control.

Poisoning is perhaps the best and easiest of the methods of destroying rats and mice. The chief objection to the use of the poisons is the danger of poisoning human beings and domestic animals and the possibility of the poisoned rats dying in inaccessible places where their decomposing bodies become obnoxious. The first objection can be overcome by the use of a mild poison and by careful placing of the baits; the second by using a slow acting poison.

Before the war red squill was the poison best suited for destroying rats. It has the advantage of being relatively harmless to man, partly because of its bitter taste and partly because of its emetic action when taken in dangerous quantities. Rats don't seem to mind the taste; and since they can't vomit, the poison has the unique property of being specific for rats. Mice are not killed by squill. The chief disadvantage of red squill is its nonuniformity which entails careful testing of each lot by the manufacturer.

However, sufficient red squill, which is found only in the Mediterranean area, has not been available since the war. A great deal of time and money has been spent in searching for new poisons. Two outstanding ones have been discovered. One of these, called "Antu," alpha napthylthiourea, is very similar in action to red squill. It is a slow poison which is specific for rats. In fact it kills brown rats only and is not particularly effective against black or roof rats or mice. "Antu" does not kill rabbits, chickens and dogs, and cats usually are made to vomit without severe poisoning. People are not endangered when it is eaten in the quantities usually available in baits. The rats are killed from edema of the lungs. Sufficient poisoned baits must be provided to kill all of the rats in the building since rats who eat insufficient amounts of the poison to kill them either will not touch any more baits or develop a resistance to the poison.

The other poison, a derivative of fluoroacetic acid, and called 1080, is deadly to all rodents and a great many other animals as well as human beings. Tests indicate that pound for pound it is not as poisonous to man as it is to rodents. However, in factories and

warehouses where it is possible to keep domestic animals and human beings away from the bait this poison should be acceptable. Rats prefer baits poisoned with 1080 to unpoisoned baits. 1080 kills quickly and anyone using it runs the risk of having the animals die in inaccessible places on the property. In general this poison would seem to be about as useful and cheaper than strychnine.

Other poisons which are effective against rats in order of their preference for use in factory buildings are barium carbonate, thallium sulfate, arsenic trioxide, phosphorus and strychnine. All of these are deadly to rodents and many animals including human beings. Strychnine is in last place because it kills so quickly with the attendant danger of the rats dying in inaccessible places on the premises. Phosphorus in the elemental form presents a fire hazard although if finely ground with other materials the danger is largely theoretical. Barium carbonate is the least poisonous to man of the group and is recommended for use in buildings.

Just as important as the poison used is the bait with which the poison is combined. Rats are extremely suspicious and oftentimes persuading them to eat the baits alone without any poison added is difficult. Baits may consist of such materials as ground bread crumbs, fresh hamburger, rolled oats, corn meal, peanut butter, ground bacon, cottonseed oil, molasses, mineral oil and glycerin. The poison is usually first mixed well with one of the liquids and then added to the dry material to form a paste. A typical formula is:

Red squill—five parts by weight.
Ground bread crumbs—forty parts by weight.
Peanut butter—four parts by weight.
Cottonseed oil—one part by weight.

It is important to use sufficient bait to kill all the rodents present since if not all are killed the remaining ones may refuse the bait. A number of small baits are better than a few large ones. The bait should be deposited along the runway of the rats and especially at the places where they are accustomed to eat. If the bait is similar to the food which the rats usually eat, the rats are more likely to take the bait.

In sections where typhus or other diseases carried by parasites of rats are prevalent, combining the poison campaign with the use

of an insecticide such as DDT is wise because of the danger to employees from the infected fleas who leave the dead rats.

Trapping

Trapping can be almost as successful in destroying rodents as poisoning but takes more skill to achieve the required results. Either steel traps or wood-based snap traps may be used, the latter being preferred for inside use. Baits, which should be securely tied to the trigger, include raw or cooked meats, bacon, fish, apple, melon, tomato, carrot, nuts or fresh bread or doughnuts. The normal food supply should be removed. It is not necessary to use any bait at all for traps which are set in rat runways. Enlarging the trigger with a piece of wood increases chances of success. If the building is heavily infested with rats many traps are required. Fifty to one hundred for a medium sized building are not too many. Since rats rely on concealment as much as possible, traps should be set close to walls, behind objects, in dark corners, or in any place where a rat would run for concealment.

Fumigation

Fumigation whenever it can be applied is the best method of destroying both rodents and insects. Successful fumigation calls for a nearly airtight building or one that can be made so without too great an expenditure. Since most older warehouses cannot be made airtight and these are the ones which ordinarily are not rat-proof, the method oftentimes is ineffective where rodents are most prevalent.

Fumigation is best suited for eliminating insects in food products in reasonably tight buildings where these products are processed or stored.

Since all of the fumigants used to kill insects and rodents are also highly toxic to man they must be used with the greatest caution. Except in plants large enough to have a trained crew, it is advisable to hire professional fumigators. These men usually bring their own equipment, know the proper concentration of gas to use, know how to make the building airtight and know how to protect themselves. Nevertheless it is wise to make sure personally that no one is left in a building which is to be fumigated and that no one enters while fumigation is going on.

Fumigation should be carried on in warm buildings, preferably 75° F. or higher, since insects are killed much quicker at these temperatures. A quiet day should be selected because no plant is completely airtight and a high wind will cause loss of gas and unequal concentration of gas in the building.

For modern airtight buildings there are a number of fumigants which are effective, including hydrocyanic acid, chloropicrin, ethylene oxide-carbon dioxide mixtures, methylformate-carbon dioxide mixtures and methyl bromide. Specific conditions will recommend one over the others, i. e., the best one for penetration of bagged or baled commodities is methyl bromide. For buildings which are not quite so airtight the only practical fumigant is hydrogen cyanide since this gas is by far the quickest acting fumigant and a killing concentration cannot be maintained for long in a leaky building.

Hydrogen cyanide can be obtained in a number of forms of which the oldest as well as the safest for non-professional use is sodium cyanide. The gas is obtained by reacting sodium cyanide with dilute sulfuric acid. For plants which are equipped with piping and nozzles for periodic fumigation liquid hydrogen cyanide contained in steel cylinders is available. For compartmented buildings either discs made of calcium cyanide or of inert material containing absorbed liquid hydrogen cyanide can be used. Calcium cyanide is also available in powder form. On exposure to air the calcium cyanide absorbs moisture and liberates hydrogen cyanide gas. About one-half pound of hydrogen cyanide gas will fumigate 1000 cubic feet of space. However, individual conditions will cause this figure to be raised or lowered. The time of fumigation will vary from twenty-four to thirty-six hours.

Besides fumigation of the entire building, some companies will find it advisable to fumigate all or some incoming materials and finished products. This may be accomplished in properly constructed vaults, bins, or for occasional fumigation, under a rubberized tarpaulin. Vacuum fumigation is the quickest, safest and most expensive of these methods. The materials to be fumigated are placed in a vacuum chamber, the air exhausted and the fumigant added. After about one hour (as against twenty-four for atmospheric fumigation) the fumigant is pumped out and air admitted. The air can be re-exhausted one or more times, known as "air washing", further to reduce the residual amount of fumigant.

Although not strictly fumigation, two other methods of controlling insects are heat and cold. Insects cannot live for more than a few minutes at a temperature exceeding 140° F. If all the infested material is brought to this temperature for ten minutes or longer the insects will be killed. Nor can insects thrive at a temperature much below 50° F. If the material is stored at this temperature or lower, all insects will be dormant and those which do not hibernate will eventually die.

Insecticides

For control of insects where fumigation is impractical because of the construction of the building, danger, or cost, insecticides may be used. Insecticides are effective against the various household insects but do not control insects contained in baled or bagged goods.

The use of DDT as a residual spray on the walls and ceilings of the building will be quite effective against flies, gnats and mosquitoes and less effective against roaches and other crawling insects.

Because of its ability to retain its killing power over long periods of time, DDT would seem to be better suited for controlling these types of insects than the space sprays containing pyrethrum or rotenone. However, DDT must be used correctly. The recommended method is to apply at the rate of from one to four quarts per 1000 square feet of surface of a 5 per cent oil solution or water suspension of DDT with a coarse nozzle held close to the surface being sprayed. The surface is actually wetted with the insecticide. The water suspension has the advantages of not penetrating porous surfaces such as brick and of being non-inflammable but has the disadvantage of leaving a visible residue on the surface. Either a dust composed of pyrethrum and sodium fluoride or fluosilicate or one composed of 10 per cent DDT in an inert powder will control the various members of the cockroach family. The dust should be inserted into cracks and crevices and along floors and shelves where the roaches are known to congregate. Both of these insecticides are slow poisons and about a week will elapse before there will be a noticeable improvement in the number of roaches.

Both DDT and sodium fluoride are poisonous and must be used with extreme caution around foods or drugs which eventually may be eaten by either man or animals. It is important to cover any food

or drug containers before spraying with DDT and to be careful not to let any of the powders become mixed with food or drugs.

The Division of Cereal and Foreign Insects of the Department of Agriculture experimented with cardboard cereal containers impregnated with DDT. The preliminary results are encouraging. Insects are kept out of the containers and insufficient poison is absorbed into the cereal to be dangerous. Nevertheless the government will not recommend this use of DDT until more experiments have been performed. If their experiments should turn out favorably, it might develop that other materials such as burlap could be impregnated safely. Especially in the drug field where only small quantities of the products are eaten by any one person the danger would seem at a minimum. The advantage of this method of control would be twofold since the bales or bags would be protected from outside infestation during storage, while any insects which are contained in one bag would be kept there. This method would of course not affect the growth of insects within the bag. Before it could be used sufficient tests would have to be run to prove that the method was safe.

Conclusions

Several other methods of insect and rodent control which include hunting and the use of cats, dogs, ferrets, viruses and other natural enemies in the case of rats, and trapping and the use of repellants, attractants and electricity in the case of insects, have been omitted from this paper because these methods either are ineffectual, too dangerous or inapplicable inside of buildings. Future developments may alter the situation. However, today the intelligent use of fumigants, poison or traps is the best way to kill rats and the use of fumigants and insecticides is the best way to kill insects. By far the most important method of control of the pests lies in the construction of buildings. Many cities have laws requiring new construction to be rat-proof although regulations should not be necessary for anyone engaged in the food or drug business. The design of new buildings makes them so nearly rat-proof that not to take advantage of making them completely so would seem very foolish. The initial cost of reconstructing older buildings may appear large, but savings over a period of years will more than make up for the initial cost.

As I have repeatedly pointed out, the most important factor in the control of pests is cleanliness. Good housekeeping eliminates

breeding places for both rodents and insecticides without which the pests cannot survive. Buildings and their premises must be kept free of trash and garbage.

To be truly effective, control of pests should extend beyond the boundaries of any one business and into the whole community. Most cities and many smaller places have programs for rat and insect control which are backed by the state. Wholehearted cooperation with these organizations will achieve results far better than any lone attempt.

The federal government has done and is doing much good work towards the control of insects and rodents. Most of the data accumulated in this paper has been obtained from the government. Since these divisions of the government are maintained solely for the public's benefit any additional information which they have is available to any one. The men are extremely helpful and are only too glad to give specific aid to individual problems.

SELECTED ABSTRACTS

Penicillin Lozenges. M. M. Malloch. *Pharm. J. 101,* 245 (1945). The author reports a method evolved for the ready preparation of penicillin pastilles at the dispensary of a military hospital. The formula used was as follows:

Powdered acacia	7 gm.
Dextrose	100 gm.
Oil of peppermint	1 minum
Penicillin sodium	30,000 units
Distilled water (approx.)	20 mils

From these quantities approximately sixty 2-gm. lozenges, each containing 500 units of penicillin, may be prepared. The penicillin sodium was rubbed with a little dextrose, after which the remaining dextrose, the acacia and the peppermint oil were incorporated. Sufficient water was then added with manipulation to produce a crumbly mass; the latter was transferred to a glass plate dusted with talc, and the lozenges were cut out with an improvised circular cutter and left to dry under normal conditions.

Although the earlier batches were prepared under sterile conditions, this technic was later abandoned because of the inadequacy of the facilities available.

The lozenges were pleasant to the taste; they were found to dissolve in one-half to one hour when kept between the gum and the cheek. Cases of Vincent's angina and follicular tonsillitis responded well to treatment with lozenges alone.

Potency tests were carried out on different batches of the lozenges stored either in the refrigerator or at room temperature for periods up to eighteen days for the former and twenty-five days for the latter. Little deterioration was observed in the lozenges stored in the refrigerator, which led to the conclusion that sterile conditions of manufacture were unnecessary. Considerably greater loss of potency occurred under storage at room temperature.

Marihuana Activity of Cannabinol. S. Loewe. *Science 102,* 615 (1945). Cannabinol, the aromatic analog of the pharmacologically potent hydroaromatic principles of Indian hemp, has been shown by bioassay on dogs to possess marihuana activity, contrary to conceptions generally accepted.

Previously, little interest has been shown in studies on any substance possessing a potency of less than 1/200 that of tetrahydrocannabinol obtained from charas (an Indian hemp preparation). In this study, two preparations of cannabinol were used: one was obtained from an aged sample of charas, the other was a crude synthetic cannabinol. The substances were administered intravenously in concentrated solution in propylene glycol.

All doses over 12.2 mg./Kg. produced marked ataxia. The action was in all respects identical with that of the natural tetrahydrocannabinols. The duration of ataxia varied from two to more than twenty-four hours according to the dose. The results indicated a potency of about 0.04, compared with synthetic racemic 7,8,9,10-tetrahydrocannabinol (having 1/15 the potency of charas tetrahydrocannabinol) as a standard.

The activity of cannabinol is of interest because of the relationship between structure and activity; it verifies previous observations that the presence or absence of marihuana activity is not determined by variations in spatial arrangement due to the presence and position of a double bond in ring A, although a considerable quantitative effect is noted.

The author, in collaboration with other investigators, has previously reported that the replacement of the hydroaromatic ring of the natural or synthetic marihuana-active dibenzopyran derivatives by cyclohexane or—heptane or two alkyl chains does not destroy their activity.

Chemistry of Penicillin. The Committee on Medical Research, O. S. R. D., Washington, and the Medical Research Council, London. *Science 102,* 627 (1945). This paper reports the collaborative observations of a large number of British and American research groups (listed in the paper) on the chemistry of the penicillins. Some of the facts disclosed have been confirmed by

synthesis. Full details of these, and also data on additional experiments, are to be published later.

Several antibiotics of the penicillin class are known, and all have the empirical formula $C_9H_{11}O_4SN_2R$. In F-penicillin (penicillin-I), R is Δ^2-pentenyl ($—CH_2.CH = CH.CH_2.CH_3$); in dihydro-F-penicillin, R is *n*-amyl; in G-penicillin (penicillin-II), R is benzyl; in X-penicillin (penicillin-III), R is *p*-hydroxybenzyl; in K-penicillin (a recent addition to the series), R is *n*-heptyl. Determinations of the molecular weights of the respective sodium salts and of the methyl ester of G-penicillin indicated that the empirical formulae truly represent the molecular weights.

The penicillins are strong monobasic acids of pK about 2.8. On treatment with hot dilute mineral acids, they yield one molecule of carbon dioxide, *penicillamine* (an amino acid identified as *d*-β,β-dimethylcysteine), and other products. Numerous derivatives of both the optically active enantiomorphs and the racemic form of penicillamine have been prepared.

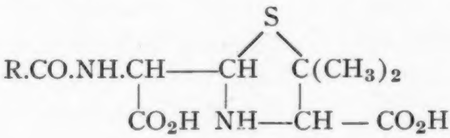
After removal of penicillamine from the acid hydrolysates of the various penicillins, the following aldehydes were isolated: from F-penicillin, F-penilloaldehyde (Δ^2-hexenoylaminoacetaldehyde, $C_8H_{13}O_2N$); from dihydro-F-penicillin, dihydro-F-penilloaldehyde (*n*-hexoylaminoacetaldehyde, $C_8H_{15}O_2N$); from G-penicillin, G-penilloaldehyde (phenylacetylaminoacetaldehyde, $C_{10}H_{11}O_2N$).

It was shown that the carbon dioxide liberated from penicillin on hydrolysis as mentioned above was derived from an unstable carboxyl group, and that the precursor of the hydrolysis products is penilloaldehyde-carboxylic acid, $R.CO.NH.CH(CO_2H).CHO$, now designated as a *penaldic acid.*

The penicillins are readily inactivated by methanol, and the products are methyl esters. Degradation by means of mercuric chloride was carried out on G- and F-penicillins, leading to the conclusions that (1) the acidic group in penicillin is identical with the carboxyl group in penicillamine, (2) that by the addition of the elements of water to penicillin a second carboxyl group is produced, and (3) that it is this new carboxyl which furnishes the carbon dioxide on treatment with hot dilute mineral acids.

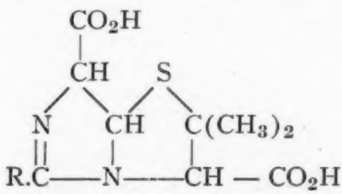
The dicarboxylic acid obtained by hydrolysis of penicillin at the site of the potential carboxyl has been termed *penicilloic acid.* Treat-

ment of penicillin with alkalies produces salts of this acid; it is believed to be the product of the action of the enzyme penicillinase on penicillin. Studies made on these acids indicate that they are thiazolidines having the formula:

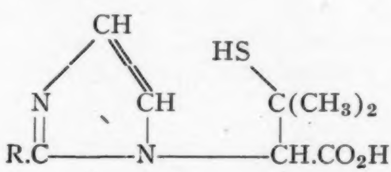


where R is one of the groups previously specified.

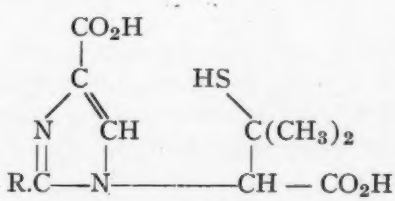
The crystalline *penillic acids,* isomeric with the penicillins, were produced by allowing the latter to stand in dilute mineral acid solution at 30°; they have the following structure:



On degradation of the penillic acids with mercuric chloride, the *penillamines* were obtained:

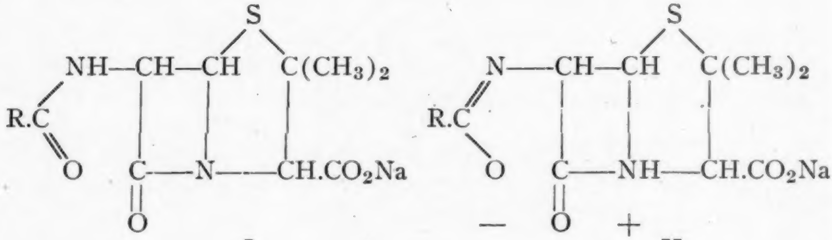


Treatment of F- and G-*penillic acids* with baryta converted them to the isomeric *isopenillic acids:*



Desthio-G-penicillin ($C_{16}H_{20}O_4N_2$), together with phenylacetyl-*l*-alanyl-*d*-valine ($C_{16}H_{22}O_4N_2$), resulted from the action of Raney nickel catalyst on sodium G-penicillin in aqueous solution.

The formulae for the full constitution of the penicillins which are now under consideration are the following, in which (I) has a β-lactam structure and (II) has an incipient azlactone grouping:



I II

Streptomyces Antibiotics. III. Degradation of Streptomycin to Streptobiosamine Derivatives. N. G. Brink, F. A. Kuehl, Jr., and K. Folkers. *Science 102,* 506 (1945). Chemical studies on streptomycin indicated that it has the constitution of a hydroxylated base termed *streptidine* attached through a glycosidic linkage to *streptobiosamine,* a disaccharide-like molecule which has been shown to contain a free or potential carbonyl group and a methylamino group.

Using the present formula for streptomycin, its acid hydrolysis may be represented:

$$\underset{\text{Streptomycin}}{C_{21}H_{37\text{-}39}N_7O_{12}} + H_2O \rightarrow \underset{\text{Streptidine}}{C_8H_{18}N_6O_4} + \underset{\text{Streptobiosamine}}{C_{13}H_{21\text{-}23}NO_9}$$

When streptomycin hydrochloride was treated with methanol containing hydrogen chloride, its biological activity decreased markedly. By chromatographic adsorption of the resulting mixture, streptidine hydrochloride was separated from the hydrochloride of a

base termed methyl streptobiosaminide dimethyl acetal hydrochloride, the formation of which occurs as follows:

$$C_{21}H_{37-39}N_7O_{12}.3HCl + 3CH_3OH \rightarrow C_8H_{18}N_6O_4.2HCl + C_{13}H_{20-22}NO_7(OCH_3)_3.HCl + H_2O$$

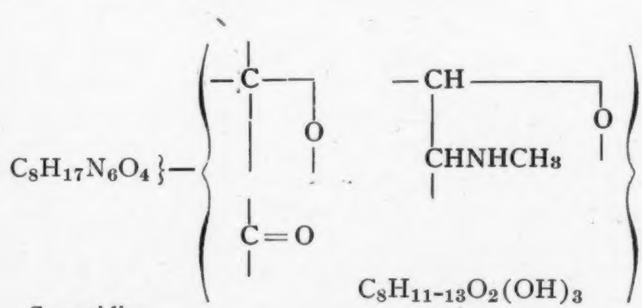
A differential acetyl determination performed upon the tetra-acetyl derivative of the latter compound revealed that three of the acetyl groups were attached to oxygen and the fourth to nitrogen.

The behavior of streptomycin toward carbonyl group reagents indicated that only one such group is present; further, since streptidine was found unreactive toward such reagents, the free or potential carbonyl group of streptomycin must exist in the disaccharide-like (streptobiosamine) portion of the molecule.

A van Slyke determination indicated that the basic nitrogen atom in streptobiosamine is not present as a primary amino group. That it exists there as a methylamino group was indicated by the liberation of methylamine upon alkaline hydrolysis, following the prior removal of the methoxyl groups from methyl streptobiosaminide dimethyl acetal hydrochloride by mild acid hydrolysis.

It is believed that the presence of a methyl group attached to the nitrogen atom of streptobiosamine indicates a residual C_{12} structure, and further that this methylamino group is located at the 2-position on one of the hexose fragments.

From the data thus far collected, the following interpretations of the structure of streptomycin are advanced:



Streptidine portion

Streptobiosamine portion

Ethylene and Propylene Glycols: Their Hygroscopic Character. J. Rae. *Pharm. J. 101,* 151 (1945). It was demonstrated experimentally that ethylene glycol is superior to either propylene glycol or glycerin in hygroscopicity; the latter two substances were approximately equal in this respect.

Weighed samples of the three substances, contained in shallow dishes, were allowed to stand over water in a desiccator; the weight of water vapor absorbed by each was determined at intervals of twenty-four hours, seventy-two hours, one week and two weeks. Expressed in percentage, the respective values found for ethylene glycol were 19.46, 38.92, 54.26 and 81.26; for propylene glycol, 13.9, 25.3, 37.7 and 57.7; for glycerin, 10.5, 22.0, 38.5 and 59.7.

In another experiment, a vanishing cream containing 86.26 per cent of water was prepared. Weighed samples of the original cream and of others to which had been added 5 per cent of ethylene glycol, propylene glycol and glycerin, respectively, were exposed to the air at room temperature. The percentage of water lost after intervals of one and two weeks was greatest in the case of the control sample (65.20 and 85.04 per cent, respectively), and least in that containing ethylene glycol (53.7 and 75.7 per cent, respectively).

After exposure to water vapor in a desiccator for one week, the control sample regained only 0.12 per cent of water; the corresponding percentages observed for the other creams were as follows: ethylene glycol, 13.6; propylene glycol, 11.0; glycerin, 11.8.

SOLID EXTRACTS

Dark red veterinary-grade petrolatum has been found to be the safest, most practical, most cohesive and non-toxic agent found to protect the skin from the effect of prolonged exposure to the sun. This finding resulted from an extensive study to develop some protective ointment that might be used by downed aviators in the Pacific who were subjected to days of intense sunlight.

AJP

Air-freight tariffs from coast to coast are now low enough to interest drug manufacturers. A twenty-five pound package goes from New York to California for $8.78. For 3000 pounds the rate is about twenty-seven cents a pound.

AJP

The most essential thing in the treatment of methanol poisoning is the elimination of acidosis by alkali therapy. Symptoms often are delayed in methanol poisoning from nine to thirty-six hours; collapse often comes suddenly thereafter. If death does not occur, coma may last several days before the patient improves and permanent blindness is then a frequent result.

AJP

Tetanus continues to be a serious disease in this country despite the improved therapeutic measures. In 1942, over 600 deaths were attributed to this cause with several times this number of cases. The best method of treatment, 30,000 units of antitoxin, is not always effective but absolute prevention is possible by active immunization with tetanus toxoid preferably followed by a "booster" injection should injury result or as a means of maintaining resistance.

Ion-exchange resins are now increasing greatly in pharmaceutical importance. They now may be used in the isolation of amino acids and thiamin, the processing of plasma and the production of enzymes, hormones, vitamins, as well as the dimineralizing of water for pharmaceutical purposes.

AJP

Few have not heard of the many applications of the Sterilamp, which is a slender electronic tube made in numerous sizes and shapes containing a mixture of gases and mercury vapor which, when excited by a current of electricity, produces the wave lengths of invisible ultraviolet lethal to bacteria, molds and viruses. During World War II, Sterilamps were used to reduce cross-infections in Army and Navy camps here and abroad. They stood guard in the nation's pharmaceutical laboratories, as a precaution against contamination. They also have proved valuable in combatting mold and bacteria growth in food processing plants, in food stores and even in domestic refrigerators, and have minimized the danger of respiratory infections in poultry houses, brooders and animal barns.

AJP

Decomposing fruits and vegetables consume oxygen so avidly that the normal oxygen content of air may be reduced from 20 to 2 per cent. At this level persons can survive only a few minutes before they completely collapse and die from asphyxia.

AJP

Unlucky birds that unknowingly flew close to the mouth of giant radar antennae during the war were stunned and roasted almost instantly due to the high frequency waves to which they were subjected. It would seem that man has not only conquered nature but is well on his way to destroy it as well.

AJP

A program of large scale testing to determine whether individuals are Rh positive or negative has been recommended. This knowledge in advance can save many fatalities during transfusion and give prior warning where stillbirth is likely to occur in Rh negative women.

BOOK REVIEWS

Harofe Haivri (The Hebrew Medical Journal), Volume 1, 1945. The eighteenth anniversary issue. Edited by Dr. Moses Einhorn of New York City.

This, a semi-annual publication and the eighteenth anniversary issue, has just made its appearance. It is a special issue dedicated to the late Henrietta Szold, a great and many faceted personality. Born in Baltimore, the first of Rabbi Benjamin Szold's eight daughters, Henrietta Szold (1860-1945) started as a teacher and until her death remained a great teacher. She was a guide and mentor to American Jewish womanhood. Her educational career began as a teacher in a private school for young ladies in Baltimore. She then undertook almost singlehanded a project of Americanization of Russian Jewish immigrants who were coming to Baltimore in the "eighties." In a long life devoted to the God of love and duty, she served as organizer, social worker, writer and editor. In 1909 she visited Palestine and recognized the necessity for medical relief in that country. Upon her return, she inspired a small group to do practical work for Palestine, and this overseas' program laid the foundation for the founding of Hadassah and the latter's medical organization work in Palestine. In 1920 Miss Szold went to Palestine to aid the Medical Units. In Palestine, she remained to aid in formulating and putting into practice the health program, to aid in introducing a sound educational foundation, to introduce social work for the needy and underprivileged and the crowning undertaking of her career, Youth Aliyah, where Henrietta became mother, teacher and guide to Hitler's innocent young victims who were brought to their ancient homeland.

Several articles on Henrietta Szold by her intimate friends and coworkers are published in this issue of Harofe Haivri. Other articles are on "The Jewish Physician and Zionism," "Hebrew Medical Terminology," book reviews and general medical and pharmaceutical news items. It is a well planned issue and significant in that it is dedicated to that saintly character, Henrietta Szold.

LOUIS GERSHENFELD.

Catalytic Chemistry. By Henry William Lohse. Chemical Publishing Co., Inc., Brooklyn, New York, 1945. xiv + 471 pp. 15 x 22.5 cm. Price: $8.50.

This book is divided into five general parts: Chapter I, Brief History of Catalytic Chemistry; Chapter II, Catalytic Theory; Chapter III, Nature and Properties of Catalysts; Chapter IV, Specific Types of Catalytic Reactions; and Chapter V, Industrial Reactions.

Chapter II discusses types of catalysis, chain reactions, inhibitors, homogeneous and heterogeneous catalytic reactions, etc. In addition, it is pointed out that the spectroscope is useful in the examination of catalysts for traces of elements which may influence their reactivity. The third chapter discusses the various elements and their compounds which are used in catalysis. Mention is made also of carriers. Seventeen types of catalytic reactions as well as enzymatic reactions are discussed in Chapter IV while the final chapter points out various industrial processes which depend upon catalysts.

The book is documented with over 1000 specific references as well as a number of general references. To one desiring to find the use of a specific catalyst or the catalyst to be employed for a type reaction the book should be useful.

The price of the book seems high for its size.

N. Rubin.

Howell's Textbook of Physiology. Fifteenth Edition. Edited by John F. Fulton, M. D., Sterling Professor of Physiology, Yale University School of Medicine, with a number of collaborators. XXXV + 1304 pages including index. W. B. Saunders Co., Philadelphia and London. 1946. Price: $8.00.

In the field of physiology the name of Howell conveys not only that of a pioneer in this important medical science but also the authorship of what has become a standard text of high repute. Dr. Howell's death early last year at the age of eighty-five terminated a long career as a foremost physiologist and author. His successors in the work of revising the fifteenth edition of the textbook on

physiology have done an excellent job. Progress in human physiology has been made in great strides with the contributions of physics and chemistry of no small importance. The correlation of all data having a bearing on physiology is in itself a colossal task. The services of twenty-four contributors in this revision speak well for its comprehensiveness, since no one person could possibly write authoritatively on all phases of any modern science. The up-to-date character of the work done is well substantiated by reading any one of its many chapters.

The text is primarily written for medical students and clinicians but pharmacologists, pharmacists and indeed all others who have need of a modern text on physiology will find it clearly written and with extensive references to the supporting literature. Pharmacists, in particular, will find that a modern text on physiology will simplify the understanding of some of the modern drugs whose action without a knowledge of basic physiology seems hopelessly complex.

L. F. T.

Glycerin—Its Industrial and Commercial Applications. By Georgia Leffingwell, Ph. D., and M. A. Lesser, B. Sc. 302 pages. Chemical Publishing Co., Inc., Brooklyn 2, N. Y. $5.00.

The authors, both of whom are associated with the Association of American Soap and Glycerin Producers, Inc., have prepared this book chiefly as a condensed version of the many formulas and products that they have uncovered or developed employing glycerin as an essential ingredient. The history and production of glycerin is covered briefly in the first chapter followed by successive chapters which consider the many uses of glycerin in a variety of products ranging from adhesives to medicinals and embracing foods, pharmaceuticals, cosmetics and all manner of technical products. The most useful aspects of the book are the many formulas presented giving a good cross-section of the many applications of glycerin as a solvent, plasticizer and humectant together with extensive references to the scientific and patent literature.

L. F. T.

Surface Active Agents—Theoretical Aspects and Applications. By C. B. F. Young, Ph. D., and K. W. Coons, Ph. D. X + 381 pages. Chemical Publishing Co., Inc., Brooklyn 2, N. Y. Price $6.00.

The authors discuss the meaning of surface tension, its cause and the effect of added substances on its value in solutions. The several methods of measuring interfacial tension are then presented together with comparative data of results obtained by each method. Of particular interest is a rather comprehensive table of commercial wetting agents, detergents and emulsifying agents with a sprinkling of unrelated chemicals, e. g., preservatives the inclusion of which is rather anomalous but in no sense destroying its usefulness.

A number of formulas are presented which are quite obviously in many cases lifted from technical brochures distributed by manufacturers of the wetting agent or detergent recommended. The authors give evidence of greater experience and knowledge in the technical fields more than in the drug and cosmetic lines.

For those who wish to save the time of referring to a number of standard texts and technical bulletins this compilation is useful but it is in no sense original or complete. A cursory reading also uncovers errors such as listing sodium gluconate as insoluble and the discussion of gelatin as if it were a single substance in spite of many papers pointing out the two totally different types as to isoelectric point, uses, etc. Those in the pharmaceutical field will find the book less of interest than chemists engaged in the formulation of products used in the textile, metal and similar trades.

L. F. T.

American Journal of Pharmacy

The American Journal of Pharmacy is the oldest continuously published scientific periodical of its kind in America, having been established by the Philadelphia College of Pharmacy in 1825. After the original issue there were three other preliminary numbers until 1829, when regular publication began. From then until 1852 four issues were published annually, with the single exception of 1847, when an additional number appeared. Six issues a year were printed from 1853 to 1870, at which time the Journal became a monthly publication.

Former Editors of the Journal have been: Daniel B. Smith, 1825-1828; Benjamin Ellis, 1829-1831; Robert E. Griffith, 1831-1836; Joseph Carson, 1836-1850; William Procter, Jr., 1850-1871; John M. Maisch, 1871-1893; Henry Trimble, 1893-1898; Henry Kraemer, 1898-1917; George M. Beringer, 1917-1921, and Ivor Griffith, 1921-1941.

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